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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/780,714	02/19/2004	Hirofumi Takikawa	TAKI3002/EM	3184

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BACON & THOMAS, PLLC
625 SLATERS LANE
FOURTH FLOOR
ALEXANDRIA, VA 22314

EXAMINER	
KEANEY, ELIZABETH MARIE	

ART UNIT	PAPER NUMBER
2882	

DATE MAILED: 03/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/780,714	TAKIKAWA ET AL.	
	Examiner	Art Unit	
	Elizabeth Keaney	2882	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 January 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14* is/are pending in the application.

4a) Of the above claim(s) *6 and 7* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 8-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Group I in the reply filed on 11 January 2006 is acknowledged. The traversal is on the ground(s) that newly added claims are linking claims. This is not found persuasive because the newly added claims are considered product by process claims not linking claims. The structure that is implied by the method, specifically a catalyst comprising Ni and In, will be given patentable weight, but the method of producing the device will not, as shown below.

The requirement is still deemed proper and is therefore made FINAL.

Claims 6 and 7 withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Group II, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 11 January 2006.

Claim Objections

Claims 11 and 12 are objected to because of the following informalities:

- Line 2: "its matrix"; should be --a matrix--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 2 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The limitation "size" renders the claim indefinite because it is unclear as to what boundary the limitation is defining, for example: thickness of a layer or diameter of a particle. For examination purposes, the Examiner has defined "size" to mean thickness.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4,8,9 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Xu et al. (US Patent 5,872,422; hereinafter Xu).

Re claim 1: As best understood by the Examiner, Xu discloses, in figure 1 and throughout the disclosure, a carbon substance comprising:

- a structure (14) having a size ranging from about 1μm to about 100μm (column 7, lines 64-67) and including carbon and a metal or metallic oxide (column 20, line 21); and
- a plurality of line-shaped bodies (20) whose diameters are smaller than about 200 nm (column 9, lines 44-48),

- wherein the line-shaped bodies include carbon as a main component thereof and grow radially from a surface of the structure.

Re claim 2: As best understood by the Examiner, Xu discloses, in figure 1 and throughout the disclosure, a carbon substance comprising:

- one or more structures (14), each having a size ranging from about 1μm to about 100μm (column 7, lines 64-67) and including carbon and a metal or metallic oxide (column 20, line 21); and
- one or more line-shaped bodies (20) whose diameter range from about 50nm to about 1μm (column 9, lines 44-48),
  - wherein the line-shaped bodies include carbon as a main component thereof and grow from surfaces of the structures.

Re claim 3: Xu discloses each of the line shaped bodies further includes a particle containing at least a metal or a metallic oxide (column 9, lines 23-24).

Re claim 4: Xu discloses, in figure 1 and throughout the disclosure, the line-shaped bodies (20) include bodies connecting to the structures (14).

Re claims 8 and 9: Xu discloses, in figure 1 and throughout the disclosure, an electron emission element which emits electrons from an electron emission material by

using a voltage difference between a first electrode and a second electrode, wherein the electron emission material is arranged on the first electrode and the second electrode is arranged facing the electron emission material (column 18, lines 35-54), wherein the electron emission material comprises the carbon substance of claims 1 or 2.

Re claim 10: Xu discloses, in figure 1 and throughout the disclosure, the line-shaped bodies (20) of the carbon substance are divided to direct in a radial manner.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xu as applied to claim 1 above, and further in view of Nettleton (US Patent Application Publication 2003/0082092).

Xu teaches all the limitations as shown above.

However, Xu fails to teach or fairly suggest the line-shaped bodies include at least one body starting from and returning to a same structure.

Nettleton discloses, in figures 3a and 3b, the substitution of a carbon nanoloop for a carbon nanotube.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute a nanoloop for the nanotube of Xu because it increases the electron emission from the structure without increasing power to the device.

Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu as applied to claims 1 and 2 above, and further in view of Smalley et al. (US Patent Application Publication 2002/0127162; hereinafter Smalley).

Xu teaches all the limitations as shown above.

However, Xu fails to teach or fairly suggest a composite material comprising the carbon substance of claims 1 or 2 in a matrix.

Smalley discloses carbon nanotubes within a matrix (paragraph 25, lines 1-4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the carbon substance of Xu within a composite material in a matrix because the matrix provides strength for the nanotube thereby preventing premature failure.

Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Xu as applied to claims 1 and 2 above, and further in view of Muroyama et al. (US Patent 6,991,949; hereinafter Muroyama).

Xu teaches all the limitations above, including a catalyst comprising Ni.

However, Xu fails to teach or fairly suggest a catalyst comprising both Ni and In.

Muroyama discloses a catalyst comprising both Ni and In (column 19, line 66-column 20, line 6).

It would have been obvious to one of ordinary skill in the art to substitute the catalyst of Muroyama for that of Xu because it provides a greater growth potential for the nanotubes.

The Examiner notes that the limitation "thermal decomposition...750C" is drawn to a product by process limitation. While the Examiner has addressed the implied structure produced by the process, a carbon substance, the process limitation is afforded no patentable weight. See MPEP 2113.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- US Patent 6,664,728 discloses that the size of the diameter of the nanotubes is dependent upon the structure particle size.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Elizabeth Keaney whose telephone number is (571)272-2489. The examiner can normally be reached on Monday,Tuesday,Thursday,Friday 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571)272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

BMK

Elizabeth Keaney
Examiner
Art Unit 2882

EDWARD J. GLICK
SUPERVISORY PATENT EXAMINER